

### **Reopening of Prosecution After Reply Brief**

1. In view of the appeal brief filed on 8/18/2006, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795

### ***Response to an Appeal Brief***

This Office Action is responsive to the Reply Brief filed on 11/19/2009. Claims 49-84 are pending. Applicant's arguments have been fully considered. Applicant's arguments with regard to claims 68 and 69 are persuasive. Upon further consideration,

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the instant claims are rejected under new grounds of rejections and thus, claims 49-84 are non-finally rejected for reasons stated herein below.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 49 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The language is unclear whether the varying in diameter through a thickness of said substrate occurs in 1) within each individual pore or 2) among the collective set of pores.

The Examiner suggests the language “each individual pore having a size that varies in diameter through a thickness of said substrate” in claim 49 to avoid 35 USC 112, 2<sup>nd</sup> issue.

Claim 55 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim is unclear whether the uniformity of the size and shape refers to 1) within each individual pore, or 2) among the collective set of pores.

The Examiner suggests the language “each individual pore is substantially uniform in size and shape” in claim 55 to avoid 35 USC 112, 2<sup>nd</sup> issue.

Claims 55 and 57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear and indefinite as to what constitutes “substantially” uniform pores.

Claim 58 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear to the Examiner as to what structure constitutes “pre-selected desired” porosity. It is further unclear whether the Applicant intends to place a comma between “said substrate” and “and” in line 6 of claim 58.

### ***Claims Analysis***

The limitation “pre-selected” in “pre-selected desired porosity” has been considered but was not given patentable weight because the courts have held that the method of forming the product is not germane to the issue of patentability of the product itself. “[Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from the product of prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP 2113. Once the examiner provides a rationale tending to show that the claimed product

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appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983).

The Examiner notes that there is no structural difference between an electrolyte with a porosity that was determined before or during or after the manufacture.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 49, 50, 56, 58, 59, 65, 66, 68 are rejected under 35 U.S.C. 102(b) as being anticipated by Agruss (US 3503808).

Agruss discloses a fuel cell comprising a support substrate supporting a cathode, anode, and electrolyte and a plurality of pores formed through said substrate, said pores having a size and shape formed in accordance with a pre-selected desired porosity.

The anode and cathode comprise potassium and thallium and are solid anode and cathode material (claim 58).


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The electrolyte is deposited in the pores (2:20-40). Agruss discloses that the support substrate is made of porous Alundum (2:35). Alundum is defined as

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**Alundum***noun Trademark*

A hard material composed of fused alumina, used as an abrasive and a refractory.

*Collins English Dictionary, © HarperCollins Publishers 2000* 

**APA | MLA | Chicago : Citing this entry**

Alundum. (2000). In *Collins English Dictionary*. Retrieved November 24, 2006, from <http://www.xreferplus.com/entry/2616224>

The Examiner notes that pores formed of fused particles will not be uniform in shape. Due to the irregularity of the pores shapes and sizes, it is noted that the pores will vary in diameter through various cross sections of the Alundum substrate, thus varying in the thickness direction.

Claims 49, 50, 52, 55, 56, 58-61, 64, 68-72, 74, 75, 77-81, 83, and 84 are rejected under 35 U.S.C. 102(b) as being anticipated by Ito (US 5234722).

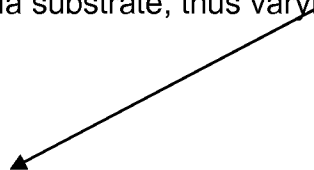
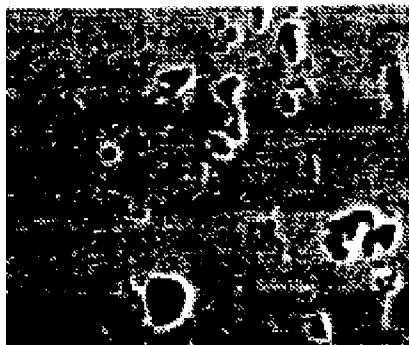
Ito discloses a fuel cell with a solid electrolyte film being formed on a substrate made of flat porous alumina substrate (see Abstract and 6:30-55). The anode and the cathode are disposed on both sides of the porous substrate coated with electrolyte. See fig. 5.

The cathode is made from LaMnO<sub>3</sub> and the anode is made from nickel-zirconia cermet (6:15-22). The electrolyte is made from yttria stabilized zirconia (6:34).

Regarding claim 69 and 78, it is noted that in the plasma spray of the electrolyte, a composition of alumina is mixed with the electrolyte material and sprayed on a porous alumina substrate. Thus, in the heating step, the alumina will fuse with the electrolyte, and thus forms a region on a microscopic scale that possesses both the electrolyte and alumina (the porous substrate material). Further, the Specification in par. [0038] supports that any suitable method of depositing the electrolyte may be used. Thus, the electrolyte deposited by plasma spray of Ito will necessarily have the porous substrate mixed with the electrolyte.

Regarding claim 49 and 60, it is noted that the pores are not completely spherical in shape. See fig. 1 and 2. Thus, it is noted that the pores vary in diameter through various cross sections of the alumina substrate, thus varying in the thickness direction.

***FIG. 1***

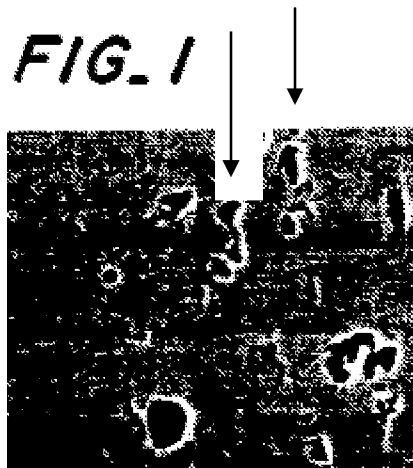


Regarding claims 52 and 61, the pores branch within the substrate. See fig 1 above.

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Regarding claim 55, Fig 1 and 2 depicts images of the porous substrate. Absent a definition of what the Applicant means by “substantially,” the pores shown in Fig 2 and 3 meet the limitation “substantially uniform in size and shape.”

Regarding claim 64, the pores are parallel. See fig. 1 below:



Claims 58, 60-62, 64, 67 are rejected under 35 U.S.C. 102(b) as being anticipated by Faita (US 5482792).

Faita discloses a bipolar plate and a gasket that supports a cathode, anode, and an electrolyte. Faita's bipolar plate or the gasket reads on Applicant's substrate. See Fig. 1. Faita discloses plurality of pores 2 or 9) and 3 (or 11) (fig. 2 and 3) formed through the bipolar plate or the gasket. The pores branch and taper to a narrow point between the openings of 2(or 9) and 3 (or 11). The branching results in a greater number of pore openings on a first side of said substrate than on a second side of the substrate. It is noted that the pores 3 (or 11) are smaller than pores 2 (or 9). The

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electrodes are made of carbon cloth supporting catalyst particles with a binder (13:17-23).

Regarding the limitation “wherein said anode is disposed on said first side of said substrate and said cathode is disposed on said second side of said substrate” (applicant’s claims 54 and 63), it is noted that the bipolar plate delivers reactant gases on both sides of the plate to the anode and cathode (7 in fig. 6). Thus, one side of the bipolar plate disposes the anode and another side of the bipolar plate disposes the cathode.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 76 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 58, in view of Hibino (A low-operating-temperature solid oxide fuel cell in hydrocarbon-air mixtures, Science, vol 288, pgs 2031-2033).

Ito does not disclose that the fuel cell is a single chamber fuel cell. However, Hibino discloses a solid oxide fuel cell that is a single chamber fuel cell. It provides for a more compact design because the reactant gases do not have to be separated. The compact design also would reduce any issues with sealing the anode and cathode



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reactant gases from each other. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the fuel cell of Ito a single chamber fuel cell for the benefit of designing a more compact fuel cell.

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Claims 73 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 72, in view of Doshi (US 6558831).

Ito discloses that the fuel electrode is made of nickel-zirconia cermet, but does not disclose that the fuel electrode is made from nickel and yttria-stabilized zirconia cermet. However, Doshi teaches that the anode is a nickel/YSZ. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Ito's anode material for Doshi's nickel/YSZ because nickel-zirconia cermet and nickel/YSZ are art recognized equivalents as an anode material. See MPEP 2144.06.

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Claim 82 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 81, in view of Doshi (US 6558831).

Ito discloses that the fuel electrode is made of nickel-zirconia cermet, but does not disclose that the fuel electrode is made from nickel and yttria-stabilized zirconia cermet. However, Doshi teaches that the anode is a nickel/YSZ. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Ito's anode material for Doshi's nickel/YSZ because nickel-zirconia cermet

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and nickel/YSZ are art recognized equivalents as an anode material. See MPEP 2144.06.

### ***Response to Arguments***

Applicant's prior art arguments filed 11/19/2009 have been fully considered but they are not persuasive.

*Applicant argues that claim 49 mandates that individual pores vary in diameter (Pg 5 of Appeal Brief).*

The Examiner respectfully disagrees. Claim 49 does not mandate that individual pores vary in diameter, and thus, the 35 USC 112, 2<sup>nd</sup> rejection is maintained.

*Applicant argues that the language “pre-selected desired porosity” is clear, referring to the instant Specification par. [0029] (Pg 6 of Appeal Brief).*

The Examiner remains unpersuaded. The language “pre-selected desired porosity” is indefinite because it does not describe the metes and boundaries of the porosity. Contrary to the Applicant's assertion, the paragraph 0029 in the Specification relied on for support also does not define what is meant by “pre-selected desired porosity”. As stated by the Applicant, it is noted that “pre-selected desired porosity” is a concept (pg 12, line 5 of Appeal Brief), and does not structurally define the porosity (emphasis added).

*Applicant argues that the Examiner alleges that Agruss teaches the limitation "said pores having a size that varies in diameter through a thickness of said substrate" without any supporting evidence or citation to the teachings of Agruss (Pg 8 of Appeal Brief).*

The Examiner notes that the Applicant has not refuted the Examiner's position stated in the rejection that "the Examiner notes that pores formed of fused particles will not be uniform in shape. Due to the irregularity of the pores shapes and sizes, it is noted that the pores will vary in diameter through various cross sections of the Alundum substrate, thus varying in the thickness direction".

*Applicant argues that the electrode materials of Agruss are solutions and not solid cathode and solid anode material because at the elevated temperature in which the fuel cell operates, the electrode material is molten (pg 9 and 10 of Appeal Brief).*

The Examiner notes that claim 58 recites a solid cathode material and a solid anode material. It is noted that potassium and thallium are solid materials because at temperature 173 C or below, thallium is solid (3:5-15). Thus, when the fuel cell is starting up from room temperature to its operating temperature, the fuel cell of Agruss would read on the instant claim limitations of "a solid cathode material" and "a solid anode material", and not at its operating temperature. The Examiner notes that the claim does not state that the electrode is solid at its operating temperature.

*Applicant argues that Figs. 1 and 2 of Ito do not show pores in the “solid” film because the micrographs show both a film material and a stabilizing material (Pg 12 of Appeal Brief).*

It is unclear as to what exactly the Applicant is arguing. It is unclear if the Applicant is arguing that the pores referred to by the Examiner in the micrographs are not pores but a stabilizing material. Should this be the Applicant's position, it is noted that the stabilizing material (ZrO<sub>2</sub>) is not a separate component of the film material (Y<sub>2</sub>O<sub>3</sub>). See 6:32-35 and Table 1. Thus, the Examiner maintains that the irregular shapes depicted in the micrographs are in actuality “pores”.

*Applicant argues that Fig. 1 does not illustrate a pore shape with two openings and tapering to a narrow point between such openings (emphasis in original).*

The Examiner notes that various regions of the pores would read on Applicant's “openings.”

*Applicant argues that Ito does not disclose “said pores having a size and shape formed in accordance with a pre-selected desired porosity” (Pg 14 of Appeal Brief).*

In light of the 35 USC 112, 2<sup>nd</sup> rejection, it is noted that the porosity has been pre-selected because the electrolyte is made as a porous material and has been predetermined by Ito that the porosity is less than 5% as stated in the Abstract of Ito.

*Applicant argues that Faita discloses a bipolar plate **at the outside of** an electrochemical cell with holes for admitting gases to the enclosed electrochemical cell (Pgs 15 of Appeal Brief) and therefore does not “support” a cathode and anode.*

The Examiner respectfully disagrees. The Examiner notes that the claim does not require the pores to be located inside the region of contact with the electrode. Nonetheless, refer to Fig. 6. The bipolar plate (1) supports electrodes (7) on both sides of the bipolar plate (1). Although the Applicant argues that one of skill in the art would never confuse the gas pathway holes in a plate with claimed pores having a size and shape formed in accordance with a pre-selected desired porosity, the Examiner notes that the gas pathway holes still read on Applicant’s “pores.” Furthermore, should the Applicant be arguing that the bipolar plate is hollow, and is merely a frame, the Examiner disagrees because the bipolar plate (1) may have a flat surface in the area of contact with the collector (14) (5:53-55).

Regarding claim 49, Applicant argues that there is no support in the prior art or the evidentiary record for the position taken by the Examiner that Agruss discloses “said pores having a size that varies in diameter through a thickness of said substrate”. In response, the Examiner reiterates that pores formed of fused particles will not be uniform in shape. Due to the irregularity of the pores shapes and sizes, it is noted that the pores will vary in diameter through various cross sections of the Alundum substrate, thus varying in the thickness direction. See rejection above.

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Regarding claim 58, Applicant argues that the electrode material of Agruss must be able to serve as electrode material during operation. (emphasis added) In response, the Examiner respectfully disagrees. It has been held by the courts that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (BdPatApp & Inter 1987). See MPEP 2115. It is noted that the electrodes are solid at temperature 173 C or below and thus reads on the claim limitation "solid cathode" and "solid anode" at temperature 173 C or below. See rejection above.

Regarding claim 49, Applicant argues that Ito does not disclose that any pores extend "through" the substrate as claimed. In response, the argument is not commensurate in scope with the claim. The claim does not require that "each pore extends through the substrate". Ito reads on the claim because multiple pores are present through or throughout the substrate and the thickness varies in diameter. Refer to rejection above and Fig 1 of Ito.

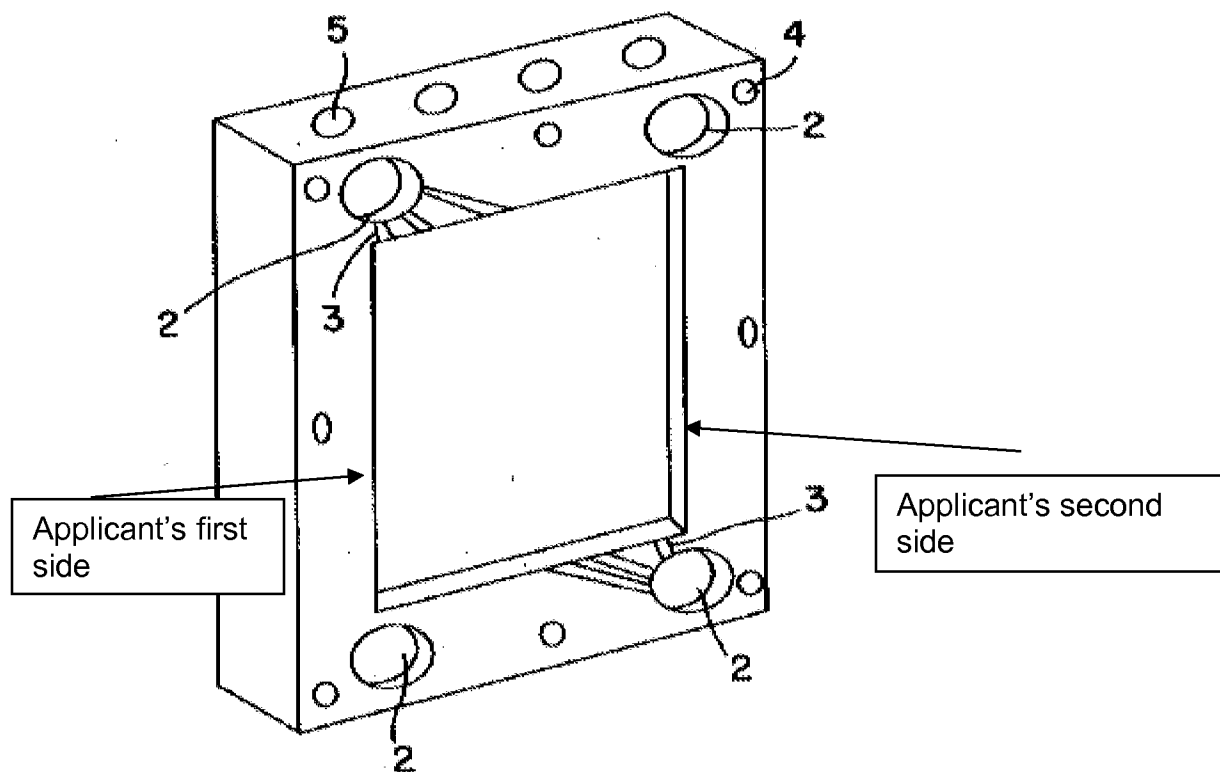
Applicant argues that Faita teaches a plate at the outside of an electrochemical cell. In response, the Examiner disagrees because the entire plate (including the peripheral frame area) is considered an electrochemical cell.

Applicant argues that Faita does not disclose "a support substrate supporting a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate and an electrolyte," as recited in claim 58.

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(Emphasis added). Applicant argues that the Answer overlooks that the claim recites that the cathode and anode materials are deposited on respective sides of the claimed substrate, And thus, the frame outside of the electrochemical cell does not qualify as the claims substrate with cathode and anode materials “deposited on” respective sides thereof.

In response, it is noted that Faita reads on the language “deposited on” by the following:



Since the electrodes are contained in the bipolar plate, it is noted that the inner periphery of the bipolar plate is in contact with the electrode material (5:60-65). Thus,

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Faita's "first side" and "second side" are interpreted above, meet the limitation "deposited on".

***Allowable Subject Matter***

Claim 51 is allowed.

Prior art does not disclose nor suggest "a fuel cell comprising a support substrate supporting a cathode, anode and electrode; and a plurality of pores formed through said substrate, wherein said pores vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point" (emphasis added) (Applicant's claim 51)

Claims 53, 54, 62, and 63 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Prior art does not disclose nor suggest "wherein branching of said pores results in a greater number of pore openings on a first side of said substrate than on a second side of said substrate" (Applicant's claims 53 and 62).

Prior art does not disclose nor suggest "wherein said anode is disposed on said first side of said substrate and said cathode is disposed on said second side of said substrate" (Applicant's claims 54 and 63).



***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Lee whose telephone number is 571-272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Cynthia Lee/  
Examiner, Art Unit 1795

/PATRICK RYAN/  
Supervisory Patent Examiner, Art  
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